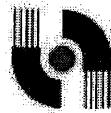


MULTIMEDIA



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STUDENT ID NO

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FINAL EXAMINATION

TRIMESTER 1, 2017/2018

DCS5068-DATA STRUCTURE & ALGORITHMS
(DIT)

21 OCTOBER 2017
9.00 am – 11.00 am
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **5** pages.
2. Answer **ALL** questions in the answer booklet provided.

Instruction: Write your answers in the answer booklet provided. Total is **100 marks**.

QUESTION 1

- a) Trace and write the output produced by the C++ program below. (4 marks)

```
#include <iostream>
using namespace std;

int main () {
    int a = 20;
    int b = 45;
    int *ip;
    int *ip2;
    int var1, var2;

    var1 = a++ * ++b;
    var2 = (a + b)/5;
    ip = &var1;
    ip2 = &var2;
    b = *ip2 + a;

    cout << "Value of a variable: ";
    cout << a << endl;
    cout << "Value of b variable: ";
    cout << b << endl;
    cout << "Value of *ip variable: ";
    cout << *ip << endl;
    cout << "Value of *ip2 variable: ";
    cout << *ip2 << endl;

    return 0;
}
```

- b) Write a full C++ program based on the output screen and requirements given below. (21 marks)

- Create a structure called *CDPDirectory*. The data members are:
 - *StaffName* : string
 - *StaffID* : string
 - *OfficePhone* : string
 - *RoomNo* : string
 - *Field* : string
 - *PigeonBox* : string
- Define a function named *PrintDirectory(...)* to display the results as shown in the sample output screen given below. Declare a function prototype for *PrintDirectory (...)*.

Continued ...

- In *main()* function,
 - Declare a structure array variable called *CDPStaff* which the size of the array is 4.
 - Using a *do..while* loop, prompt the user to enter *StaffName*, *StaffID*, *OfficePhone*, *RoomNo*, *Field* and *PigeonBox* data.
 - Call a function *PrintDirectory(...)* and pass the structure variable as parameter to display the information as shown in the sample output.

Sample Output Screen	
Data Entered	Information Displayed
Please enter Employee data:	You have entered these info:
Data No 1 Staff Name: Emily Staff ID: 100133 Office Number: 07-2345678 Room Number: FG233 Field: IT Pigeon Box No: D01	Data No 1 Staff Name: Emily Staff ID: 100133 Office Number: 07-2345678 Room Number: FG233 Field: IT Pigeon Box No: D01
Data No 2 Staff Name: Kamal Staff ID: 101456 Office Number: 07-2345777 Room Number: FG240 Field: Engineering Pigeon Box No: A15	Data No 2 Staff Name: Kamal Staff ID: 101456 Office Number: 07-2345777 Room Number: FG240 Field: Engineering Pigeon Box No: A15
Data No 3 Staff Name: Vijay Staff ID: 103976 Office Number: 07-2345498 Room Number: FG240 Field: Accounting Pigeon Box No: E12	Data No 3 Staff Name: Vijay Staff ID: 103976 Office Number: 07-2345498 Room Number: FG240 Field: Accounting Pigeon Box No: E12

[Total 25 marks]

Continued ...

QUESTION 2

- a) Given prefix expression below:

$$*+AB*-C-AD+BC$$

- i) Write it in infix expression. (3 marks)
- ii) If the values of A, B, C and D are 5,4,8,2, respectively write the final value. (1 mark)

- b) List and briefly explain any **FIVE** stack Operations/Functions. (10 marks)

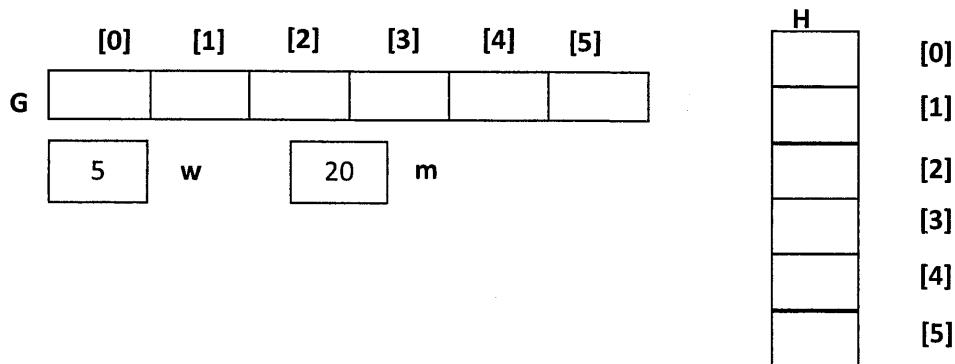
- c) Table below represents an array implementation of a linked list.

Index	Data	Link
0	9	
1	55	
2	34	
3	84	
4	26	
5	19	
6	87	
7	45	

- i) Taking **0** as the start of the list and **55** as a dummy representing the end of the list, fill in the link for all the elements in table to maintain a list in ascending order. (4 marks)
- ii) Based on the answer in c (i), draw an updated table after data **66** is added and data **55** is deleted. (2 marks)

Continued ...

- d) Suppose **G** is an empty stack of integer with **6** elements and **H** is an empty queue of integers with **6** elements. There are two integers **m** and **w**.



Draw the content of the final diagrams of **G**, **H** and write the final value of **m** and **w** after the execution of following operations: (5 marks)

- i) `G.push(m*w);`
- ii) `G.push(m);`
- iii) `G.push(w+12);`
- iv) `m = G.pop();`
- v) `H.append(w+6);`
- vi) `H.append(20 + m);`
- vii) `H.append(G.pop()% 6);`
- viii) `w = H.serve() * (m + G.pop());`
- ix) `G.push(m*5);`
- x) `H.append(w % 7);`

[Total 25 marks]

Continued ...

QUESTION 3

- a) By using binary search, show step by step on how to find the target **56** in the list given below. (13 marks)

```
int Table [] = {26, 32, 40, 56, 59, 63, 67, 75, 81}, target, first, last, mid;
```

- b) Assume a hash table with **6** locations and the hashing function $h(x) = (x+3) \% 6$. Show the index for each key and the result of the hash table when the following integers are inserted in the order given. Use Quadratic Probing to solve the collision. (8 marks)

12, 9, 18, 16

- c) Given an array that contains the elements as shown in the diagram below, sort the sequence of numbers in **descending order** by using **Insertion Sort**. (4 marks)

76	10	58	89	67
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[Total 25 marks]

QUESTION 4

- a) Based on the data given below,

48, 89, 70, 36, 73, 39, 54, 98, 29, 68

- i) Draw a binary tree. (5 marks)
- ii) Trace the nodes using PostOrder traversal from binary tree in a (i). (3 marks)
- iii) Insert a node with data **38** into the binary tree in a (i). (1 mark)
- iv) Delete the node with data **70** from the binary tree in a (ii). (2 marks)

- b) Consider the following specification of a graph G:

$$V(G) = \{A, B, C, D, E, F\}$$

$$E(G) = \{(A, B), (A, E), (B, C), (C, D), (D, B), (E, C), (E, F), (F, A)\}$$

- i) Draw a directed graph. (7 marks)
- ii) Draw its adjacency matrix. (7 marks)

[Total 25 marks]

End of Page.